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ABSTRACT

The Cincinnati Public Schools have been exploring new applications of computers in the areas of program planning, management, and evaluation. For the past 10 years, they have collected and computer-stored information on student, staff, administrative, and socioeconomic variables for each school. Data on a selected set of the variables best descriptive of individual school status are being entered into Apple II microcomputer files for use in a school profile program, which will allow display of individual school file records and comparison to the all-school average on each variable. A trend analysis/forecasting program is also being developed using individual school files, which will contain data on the same set of variables, and provide extrapolations of future trend lines for a particular variable. Another program will project the effect of specific program interventions on a school variable. A program for producing PERT charts is also under development which will adapt currently available software to produce project activities schedules, using the Critical Path Analysis method to determine appropriate activity timelines. Other applications include provision of a continual monitoring and updating function for program implementation and evaluation functions using statistical programs. The possibilities for microcomputer support for educational planning and development are just beginning to be explored. This report provides 11 references. (LMM)

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MICROCOMPUTER APPLICATIONS IN EDUCATIONAL PROGRAM PLANNING & DEVELOPMENT

Paper Presented at

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March 1982

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MICROCOMPUTER APPLICATIONS IN EDUCATIONAL PROGRAM PLANNING & DEVELOPMENT

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Introduction

Unlike the original computer-assisted instruction "revolution" in the early seventies, the advent of microcomputers in the schools promises to make a lasting and significant change in the ways in which children learn. The ease of access and use of microcomputers together with the increasing availability of better quality software mean that students and teachers of the future will be as familiar and comfortable with the computer in their classrooms as they now are with pencils and chalk.

Even as this latest computer revolution is occurring in the schools, educators are finding many non-instructional applications for microcomputers as well. Student accounting, fiscal management, class scheduling, and other kinds of routine data management are some of these types of uses. Recently, in the Cincinnati Public Schools, we have been exploring some new applications in the areas of program planning, management and evaluation. This paper reports on some of these developments.

Background

Computer applications in education first began seriously in the late sixties with the initial development of computer-assisted instructional software, sometimes called courseware. These

early CAI lessons were made to be run on large "main-frame" computers that had been designed primarily for business and scientific purposes. This software was often written by a computer programmer with little knowledge of learning principles familiar to educators. The programs ran slowly in very rigid formats determined by hardware limitations and the eccentricities of the Cobol and Fortran programming languages in which they were written. That is, if they ran at all. Quite often, teachers had to share computer time with other users making for frequent and inopportune periods of "downtime" for instruction.

However, one beneficial outcome of the inital CAI efforts in education was the development of computer-managed instruction (CMI) in which computers were used to monitor student progress in well-defined skill areas. Computer-based instructional management systems are capable of generating detailed reports to be used in making decisions about student placement, remediation, or advancement. The Cincinnati Public Schools has developed a highly successful CMI system called the Cincinnati Instructional Management System (CIMS) which has been adopted by a number of other school districts around the country.

In the past two to three years, educators have begun to explore seriously the use of microcomputers for instructional purposes. At this point, it is clear that hardware development, the capabilities of the microcomputers themselves, far exceeds software development, the courseware available to run on the computers. Some developers, notably the Minnesota Educational Computer Consortium, are beginning to publish high-quality software that goes beyond the original drill-and-practice applications of CAI to utilize the capacities of the microcomputer for tutorial and simulation activities as well as for teaching problem-solving and higher level thinking skills.

In addition to the many instructional uses of microcomputers in education, a variety of non-instructional applications have also been developed. These include student attendance monitoring, test scoring and grade reporting, class scheduling, and any number of fiscal accounting applications. While these uses have implications for educational programming, there has been little exploration of the potential of computers for program planning and development in education. This is in sharp contrast to the situation in the business world where computers are routinely used not only for inventory control, accounting, and other fiscal management tasks but also for planning and forecasting, resource allocation, and monitoring of project and program implementation. In the Cincinnati Public Schools, we have recently begun to explore and test these kinds of planning, development, and evaluation applications.

Approach

The Planning and Development Branch of the Department of Curriculum and Instruction in the Cincinnati Public Schools has the organizational responsibility for needs assessment, planning, and program development activities of the school district. As such, Branch personnel collect and analyze data and information from both the school and district-wide levels to assess program needs in the district. Branch members also develop short and long-range forecasts for the school system and identify promising program options. Once programs are developed and in place, Branch staff are responsible for directing and monitoring program activity, to see that it meets scheduled deadlines, and for updating decision-makers on progress. Finally, Branch personnel use process and outcome evaluation information to develop recommendations for program

modification and further development. It is for these types of planning and development activities that microcomputer support is being developed.

For the past ten years, the Cincinnati school district has collected and stored information on a number of student, staff, administrative, and socio-economic variables for each of its sixty elementary and twenty secondary schools. This information has been kept on the district's main computer and used primarily for year-end or special reports. Data on a selected set of the variables that are best descriptive of individual school status are being entered into files on an Apple II microcomputer for use in a School Profile Program. The variables in the school profile include the following:

- average daily membership
- average daily attendance
- percent minority students
- reading achievement test scores
- math achievement test scores
- per/pupil expenditure
- pupil/teacher ratio
- percent low income students
- average years of staff teaching experience

The School Profile Program will allow an individual school file record to be displayed and compared to the average for all schools at its level on each of the variables. In addition, a group of schools within a specified range, e.g., those with attendance below 85% can be designated and their status on the other variables can be displayed. With this application, it is possible to identify special characteristics of schools within the specified range. See Appendix A for an example

of this type of output.

Using this information, it can be determined whether schools with the specified characteristic differ significantly from the district-wide averages on the other variables of interest. Thus, it will be possible not only to pinpoint which schools are experiencing a particular problem but also to see what some of the other contributing factors might be. While this kind of information could be calculated from the year-end reports, the advantage afforded by the School Profile Program is the immediate access provided to the data and the ability to call out any combination of school variables for inspection.

A second application that is being developed in the area of planning is a trend analysis/forecasting program. This program uses individual school files containing data from the past five years on the same set of variables listed previously. Two types of output will be available from the program. The first shows a regression line for the past five years on any of the variables. This trend line will show whether a school or subset of schools has experienced an overall increase or decrease in the factor of interest in the previous five years.

A second type of output from the program is the extrapolation of future trend lines for a particular variable. Using the five-year historical data for a school, the regression line is extended for a three to five year period to show the direction of the variable if no intervention occurs at the school. For example, the rate of decrease in reading or math achievement for a particular school can be projected for the next five years assuming that the rate for the previous five years holds. The same type of projection could be made for a group of schools. See Appendix B for an example of this type of report.

At this time, trend lines for only one variable at a time can be

determined. It is planned to program the Apple microcomputer to develop trend lines using a combination of variables in a multiple regression format. However, even the present program capability allows predictions to be made regarding future performance at a school in order to determine whether intervention with a special program is necessary. Thus, if attendance at a particular school is predicted to drop below a certain unacceptable level, a program may be instituted, the results of which could be measured against the projected trend line for the school.

Another program capability under development is one which will illustrate the effect of specific program interventions on a school variable. Using data obtained from previous experience with other schools, the effect of a program on a school variable could be simulated to observe its estimated effect. Thus, it would be possible to show the effect of a special reading program on reading achievement for a school experiencing low reading test scores. The effects of combinations of variables could also be programmed to give a more realistic picture since interventions rarely occur in isolation from other effects.

A third type of application that is under development for the Apple is a program for producing PERT charts. This program will adapt currently available software to produce schedules of project activities using the Critical Path Analysis method to determine appropriate activity timelines. The projected number of days for each of the project tasks will be entered into the microcomputer and the program will determine a minimum, optimal, and maximum time duration for the entire project. Output from the program will include a PERT network showing the interrelationship of project events, and a listing of project activities with beginning and completion dates and persons responsible for each activity.

A fourth application has been in use in the Cincinnati schools this

year to provide a continual monitoring and updating function for program implementation. In the Cincinnati Public Schools, goals and subgoals are set for the entire district each year. The Goal Management Report program provides video or print output of the current status of subgoal progress at the task level. Reports are sent to subgoal managers for updating and their responses are entered directly into the Apple microcomputer. Output shows the number and description of each task related to a subgoal, the beginning and completion dates, person responsible, and the current status of the task. An example of this report is shown in Appendix C.

Updates are prepared on a bi-monthly basis for goal managers. It is planned to use the same program to monitor implementation of a long-range plan for the school district that is currently under development. The same program may be used to monitor implementation of state and federal programs in the school district.

Finally, the evaluation function is probably the most common purpose served by computers. However, until recently, there have been few quality programs for statistical analysis of educational data. Most of the statistical packages that have been written for the Apple microcomputers were developed for business or technical use and do not have the flexibility of the SPSS and other large computer packages. In Cincinnati, we have been writing statistical programs to run on the Apple as the need arises. These include parametric and non-parametric measures of simple effects and correlations that also use the graphics capabilities of the Apple to plot data points. For example, included in the program that computes the Pearson product-moment correlation is a function for printing out the scatterplot and regression line of the two variables. The programs also allow for the data to be input

from disk files or directly from the keyboard. Eventually,it is planned to enable the statistical programs to access the school variable files described in the earlier applications so that statistical tests can be applied directly to the profile and trend analysis output from those applications.

Summary

The possibilities for microcomputer support for educational planning and development are just beginning to be explored. The applications described above are in various stages of development, from initial planning and programming to full usage. One important lesson that has been learned is the tremendous amount of development time it takes to write "bug-free" programs that produce the desired output in a useful format. As we continue to develop and test these applications for needs assessment, forecasting, and program planning and monitoring, we will be evaluating their effectiveness in improving program development on a district-wide basis. It is expected that the results will show a significant improvement in our ability to plan and develop effective educational programs for the Cincinnati Public School system.

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APPENDIX A

CINCINNATI PUBLIC SCHOOLS

PLANNING AND DEVELOPMENT BRANCH

SCHOOL PROFILE PROGRAM

VARIABLE	SCHOOL RECORD N=1 *	SCHOOL DISTRICT AVERAGE N=12
1. Average daily membership	635	575
2. Average daily attendance	89.8%	84.3%
3. Percent minority students	28.1%	55.3%
4. Reading-Percent at or above median	42.6%	38.8%
5. Math-Percent at or above median	45.6%	42.7%
6. Per Pupil expenditure	$2004.	$2224.
7. Pupil/teacher ratio	20.3	18.4
8. Percent low income students	29.8	54.5
9. Average years of staff teaching experience	15	13

* Sample junior high school

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APPENDIX A (Cont.)

CINCINNATI PUBLIC SCHOOLS
PLANNING AND DEVELOPMENT BRANCH
SCHOOL PROFILE PROGRAM

VARIABLE	SCHOOL RECORD N=5 *	SCHOOL DISTRICT AVERAGE N=12
1. Average daily membership	618	573
2. Average daily attendance	80.8%	84.3%
3. Percent minority students	57.7%	55.3%
4. Reading-percent at or above median	21.5%	38.8%
5. Math-percent at or above median	25.9%	42.7%
6. Per pupil expenditure	$2163.	$2224.
7. Pupil/teacher ratio	18.9%	18.4
8. Percent low income students	64.3%	54.5%
9. Average years of staff teaching experience	14	13

* Junior high schools with less than 85% average daily attendance

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APPENDIX B

CINCINNTI PUBLIC SCHOOLS
PLANNING AND DEVELOPMENT BRANCH
TREND PROGRAM

READING ACHIEVEMENT *

YEAR	PROFILE VALUES
1977	5.1
1978	4
1979	5.8
1980	4.1
1981	3.5
	PREDICTED VALUES
1982	3.5833978
1983	3.25999706
1984	2.94333633
1985	2.6399956
1986	2.32999487

MEDIAN STANINE

77 78 79 80 81
YEARS

MEDIAN STANINE

77 78 79 80 81 82 83 84 85 86
YEARS

* Sample school

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APPENDIX C

SUBGOAL MANAGER: J. GRATE REPORT DATE: 01-27-82
SUBGOAL # 1.01 IMPLEMENT THE MINIMUM COMPETENCIES INSTRUCTION TESTING & COMMUNICATION COMPONENTS DISTRICT-WIDEAT GR.3 & CONTINUE FIELD TESTING & PLANNING AT GRS. 6 & 9

TASK #	TASK DESCRIPTION	PERSON RESPONSIBLE	START DATE	COMPLETE DATE	STATUS
1.01.01	PLAN & CONDUCT TRAINING FOR ADMINISTRATORS SUPERVISORS & TEACHERS	J.GRATE	09-05-81	04-15-82	COMPLETED
1.01.02	ORIENT PARENTS & COMMUNITY TO THE MCP & PROVIDE HELP FOR PARENTS	CCC	10-06-81	05-30-82	IN PROCESS
1.01.03	PROVIDE MCP MATERIALS FOR ALL GR.3 CLASSROOMS & FOR GR.6 & 9 PILOT SCHOOLS	J.WALTER	08-01-81	05-30-82	COMPLETED
1.01.04	DEVELOP & IMPLEMENT MONITORING ACTIVITIES FOR THE INSTRUCTION TESTING & COMMUNICATIONS COMPONENTS	J.GRATE	09-15-81	06-11-82	IN PROCESS
1.01.05	CONDUCT SPRING MCP TESTING IN ALL GR.3 CLASSROOMS & IN PILOT SCHOOLS GRS. 6 & 9	Z.AHMAD	03-15-82	07-15-82	TO BEGIN
1.01.06	DEVELOP PLANS FOR REMEDIATION PROGRAMS	GRATE ET AL	09-15-81	06-15-82	IN PROCESS
1.01.07	PLAN SYSTEM-WIDE EXPANSION OF MCP FOR GRS. 6 & 9	J.GRATE	01-02-82	06-11-82	TO BEGIN